COMPOSITE PROTECTION SYSTEM

Background of the Invention

The present invention relates to a composite system to provide protection against radiation, blasts, chemical, biological and/or ballistic attack.

At present, the predominant method of ballistic protection, other than body armor, which is generally ceramic and/or Kevlar and ballistic fiberglass, is to provide steel armor.

In addition, existing vehicular armor is permanently attached to a vehicle or to the vehicle chassis, which are designed around the ballistic protection systems and the engineered weight requirements. Some existing systems, such as adhesive armor, are designed specifically to fit particular vehicles and are permanently attached.

It is therefore an object of the present application to provide an improved threat protection system that overcomes the drawbacks of heretofore known systems.

Brief Description of the Drawings

This object, and other objects and advantages of the present invention, will appear more clearly from the following specification in conjunction with the accompanying schematic drawings, in which:

Fig. 1 shows a first embodiment of an inventive composite protection system;

Fig. 2 shows a second exemplary embodiment of an inventive composite protection system;

Fig. 3 shows a support system for the embodiment of Fig. 2;

Fig. 4 shows a further exemplary embodiment of an inventive composite protection system; and

Fig. 5 shows a sack for the embodiment of Fig. 2.

Summary of the Invention

The composite protection system of the present application comprises at least one first aluminum panel, and means disposed at least in part against the aluminum panel to provide protection against one or more attack threats.

The means for providing protection against threats can be in the form of a plurality of tubes, ceramic tiles, and/or layers of various materials.

In contrast to the known steel armor ballistic protection systems, which are heavy and generally result in the deflection of projectiles and ricochets, the system of the present application, especially where the means for protecting against threats are ceramic tiles, absorbs a projectile with no ricochet and the collateral damage associated therewith. In addition, this system of the present invention has about one third of the weight of the armor steel systems.

The system of the present application is also economical and

easy to produce. Furthermore, due to its light weight, it is easy to transport and is hence portable, and can also be used in airframe platforms.

In contrast to the known vehicular armor systems, the system of the present invention is adapted to fit into any vehicle, such as a typical police cruiser, and provides immediate ballistic protection that can then be easily removed once a threat is defeated or terminated. By way of example only, a police cruiser could be quickly equipped with several inventive system modules that would serve as a shield for the advancement, retreat or rescue of officers. In a similar manner, the inventive system could be used as temporary body armor. Furthermore, the same system panel could also be inserted into a sack, thus standardizing armor types, which results in a savings of manufacturing and inventory costs as well as training.

The modular design of the inventive composite protection systems provides a great expansion flexibility. For example, the system of the present invention can provide protection for a single person, or for a group of persons. Furthermore, the inventive system can be assembled to provide a ballistic barrier in almost any venue.

In addition, since the systems of the present application are relatively thin, they can be built into existing wall systems, for example as a layer under drywall.

Where tubes are provided in the system, such panel systems

provide great flexibility as a standardized base unit. In particular, the tubes are interchangeable and can be quickly changed out to meet specific threats, for maintenance, where damaged, or for repair purposes. The system can be customized to defeat specific threats, or several modules can be utilized together to defeat or minimize ballistic, radiological, thermal, chemical and/or biological threats.

The systems of the present application are impervious to the environment, and can be used indoors and outdoors and in the most extreme environmental situations.

Further specific features of the present invention will be described in detail subsequently.

Description of Specific Embodiments

Referring now to the drawings in detail, illustrated in Fig. 1 is one exemplary embodiment of a composite protection system, which is designated generally by the reference numeral 20.

In its simplest form, the composite system comprises a single panel 21, preferably of aluminum, and means for providing protection against one or more attack threats. Such means, which will be discussed in detail subsequently, are disposed at least in part against the panel 21. Aluminum is the preferred material for panel 21 because of its high strength to weight ratio, its ease of fabrication alternatives, because it is relatively inexpensive and supplies are plentiful, and it

does not require new techniques or exotic labor. Aluminum provides resistance to erosion, rust and UV attack and is an excellent material for limiting gamma ray penetration.

In the illustrated embodiment, the means that provide protection against attack threats comprises a plurality of tubes 22, for example of aluminum. A single row of tubes, or two or more rows, can be provided. The tubes 22 are disposed against the panel 21 and/or against one another. The tubes 22 may be hollow, in which case they could be empty or filled, as will be discussed subsequently. The tubes could also be solid tubes.

A second panel 23, also preferably of aluminum, can also be provided, with the tubes 22 or other means being sandwiched between the two panels 21 and 23. The tubes 22 can be loosely inserted, or can be bonded to the panels 21, 23 and/or to each other, for example via an appropriate adhesive, a clamping mechanism, welding or any other suitable connecting means. Additional panels could be connected to one or more of the remaining four sides as indicated by way of example by the reference numeral 25.

As shown in Fig. 4, in addition to the attack threat means 22, or as an alternative thereto, other threat protection means could be provided, especially in the form of layers, which are indicated generally in Fig. 4 by the reference numeral 27. One or more of such layers could be provided, and can comprise such materials as tantalum (for

example for radiological protection), ballistic fiberglass (for example for ballistic protection), foam, in particular foamed or puffed concrete, which comprises cement in resin and is an air-entrapped mixture that has the ability to yield, Kevlar, nylon or steel. The tubes may be filled with cylinders containing, for example, carbon steel, air, nitrogen or some other inert gas, dirt, sand and possibly water. The cylinders are standardized and also made of aluminum, and are designed to snuggly fit into the tubes. Additional aluminum layers could also be provided.

As discussed above, the tubes 22 could be filled, with the material selected therefor being a function of the threat or threats that are expected to be encountered. The filler material can be any of the materials listed with respect to the layer or layers 27, or the cylinders.

A second exemplary embodiment of the composite protection system of the present application is illustrated in Fig. 2, and is designated generally by the reference numeral 30. Here again, in its simplest form a single panel 31, again preferably of aluminum, is provided. In this embodiment, the means providing protection against attack threats is in the form of a tile 32, in particular a ceramic armor tile, preferably comprised of aluminum oxide. A second panel 33, also preferably of aluminum, can furthermore be provided, in which case the tile 32 would be sandwiched between the two aluminum panels 31 and 33. The ceramic tile can be adhesively connected to the panels 31 and 33, or a mechanical means can be used to provide securement

of the system components. In addition, sides, a top, and/or a bottom, preferably in the form of aluminum sheets, can also be provided, with such additional aluminum sheets being welded or otherwise secured to the panels 31 and/or 33, and containing the ceramic tile 32 between the panels.

In order to provide additional support, and/or to make it possible to stack a number of panel systems together, tubes 35, for example aluminum tubes, can be welded or otherwise attached to one of the panels 31, 33 of the composite system 30, as illustrated in Fig. 3. In the illustrated embodiment, two systems 30 are shown stacked on top of one another. Also indicated schematically is a support system 36 to allow the stacked panels to be placed upright in position. In the illustrated embodiment, a strut 37 is illustrated as an optional energy absorbent pneumatic cylinder type of strut. Also shown is an optional top pressure plate 38, again for example made of aluminum. This pressure plate can be seated on and secured to threaded members that are disposed in the tubes 35.

As indicated schematically by the reference numeral 40 in Fig. 4, either the entire assembly of the embodiment of Fig. 2, or merely the ceramic tile 32 thereof, can be provided as the means for protecting against attack threats, or can be provided in addition thereto. In the latter case, the ceramic tile 32 or composite system 30 is disposed on a side of the aluminum panel 21 that is opposite from the tubes 22

and/or layers 27. To provide an even more portable composite protection system, a handle can be provided on one or more of the panels, 21, 23 or 31, 33, or even on the tubes 22, the layers 27 or on the ceramic tile 32.

Another easily portable system is illustrated in Fig. 5. Shown is a sack or other container 42, for example out of heavy duty ballistic nylon or another semi-flexible high strength fabric. The composite system 30 of Fig. 2 is placed into or on the sack 42, with the system 30 then being secured in the sack by means of straps, zippers or other suitable closure means.

As indicated above, and as shown by way of example in Fig. 3, two or more of the various composite systems, such as the systems 20 and 30, can be stacked or otherwise interconnected to provide larger barriers against attack threats.

The present invention is, of course, in no way restricted to the specific disclosure of the specification and drawings, but also encompasses any modifications within the scope of the appended claims.